

Climate Variability in Whitebark Pine Ecosystems: A Paleoperspective

Kipfmueller, Kurt F.

University of Minnesota, Department of Geography, Minneapolis MN 55455

There is a broad consensus within the scientific community that temperatures over the most recent 50 years have been warmer than in perhaps the past millennium, due at least in part to rising greenhouse gas concentrations brought about by human activity. What remain uncertain are the impacts any potential warming might have on sensitive habitats. In particular, it is likely that increases in temperature will lead to shifts in disturbance regimes such as fire and insect outbreaks. Here I review our current understanding of climate variability with an emphasis on the potential impacts on whitebark pine. I will also discuss the importance of whitebark pine in better understanding climate variations via the development of reconstructions of past climate. In this respect, whitebark pine affords a great deal of opportunity. Since it is long-lived and grows near the physiological limits of tree growth the variations in its ring-widths are sensitive to changes in climate. Whitebark pine has been little used for the reconstruction of climate, but the growth characteristics have been shown to capture decadal scale temperature variability effectively. The application of tree growth information from whitebark pine to infer climate variations also has a number of important challenges. For example, it appears that rising temperatures over the course of the 20th century have resulted in a shift from temperature as a primary limiting growth factor to a more mixed signal whereby moisture conditions have become more limiting. The mechanisms responsible for this shift are currently unclear. It is critical to consider the role of climate variation in development of management plans meant to preserve this critical species and its unique habitat.